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Hepatitis C virus prevalence and estimated incidence among new injectors during the opioid epidemic in New York City, 2000 to 2017: Protective effects of non-injecting drug use

Don C. Des Jarlais[1], **Kamyar Arasteh**[1], **Jonathan Feelemyer**[1], **Courtney McKnight**[1], **David M. Barnes**[1], **David C. Perlman**[1], **Anneli Uuskula**[3], **Hannah LF Cooper**[2], and **Susan Tross**[4]

[1]Icahn School of Medicine at Mount Sinai, New York, NY

[2]Department of Behavioral Sciences and Health Education, Rollins School of Public Health, Emory University, Atlanta Georgia

[3]University of Tartu, Tartu, Estonia

[4]Department of Psychiatry, Columbia University, New York, NY

Abstract

Objective: Assess hepatitis C virus (HCV) prevalence and incidence among person who began injecting drugs during the opioid epidemic in New York City (NYC) and identify possible new directions for reducing HCV infection among persons who inject drugs.

Methods: 846 persons who began injecting drugs between 2000 and 2017 were recruited from persons entering Mount Sinai Beth Israel substance use treatment programs. A structured interview was administered and HCV antibody testing conducted. Protective effects of noninjecting drug use were examined among persons who “reversed transitioned” to non-injecting drug use and persons who used non-injected heroin in addition to injecting.

Results: Participants were 79% male, 41% White, 15% African-American, 40% Latinx, with a mean age of 35. Of those who began injecting in 2000 or later, 97 persons (11%) “reverse transitioned” back to non-injecting drug use. Reverse transitioning was strongly associated with lower HCV seroprevalence (30% versus 47% among those who continued injecting, $p<0.005$). Among those who continued injecting, HCV seropositivity was inversely associated with current non-injecting heroin use (AOR=0.72, 95%CI 0.52–0.99). HCV incidence among persons

Correspondence: Don C. Des Jarlais, The Baron Edmond de Rothschild Chemical Dependency Institute, Mount Sinai Beth Israel, 39 Broadway 5th Floor Suite 530, New York, NY 10006, Phone: 212-256-2548.

Contributors

Don Des Jarlais conceived the study; Courtney McKnight managed data collection; Kamyar Arasteh performed statistical analysis; Jonathan Feelemyer worked with data analysis and managed final editing of manuscript; Hannah Cooper, David Perlman, Susan Tross, David Barnes and Anneli Uuskula contributed to editing of the manuscript. All authors reviewed the full study and results prior to submission to the journal. All co-authors have approved the final manuscript and the revisions that are being submitted to the editor.

Author Disclosures

Conflict of Interest

No conflict declared.

continuing to inject was estimated as 13/100 person-years. HCV seropositive persons currently injecting cocaine were particularly likely to report behavior likely to transmit HCV.

Conclusions: Similar to other locations in the US, NYC is experiencing high rates of HCV infection among persons who have begun injecting since 2000. New interventions that facilitate substitution of non-injecting for injecting drug use and that reduce transmission behavior among HCV seropositives may provide additional methods for reducing HCV transmission.

Keywords

Persons Who Inject Drugs; HIV; Hepatitis C; Opioid Epidemic

1. Introduction

The US is currently experiencing an opioid epidemic that has officially been declared a "public health emergency" (Gostin et al., 2017). There are multiple components to this epidemic, including excessive marketing, over-prescription and diversion of opioid analgesics, transitions from opioid analgesic use to heroin use, and transitions from oral and intranasal drug use to injecting drug use. The increase in overdose deaths, from 17,415 in 2000 to 63,632 in 2016 (Centers for Disease Control and Prevention, 2018; Hedegaard et al., 2017) may be the most dramatic indicator of the seriousness of this epidemic. Concomitant with transitions to injecting drug use, large increases in hepatitis C virus (HCV) infection have also occurred during the opioid epidemic (Des Jarlais et al., 2018; Zibbell et al., 2018). There has been considerable attention given to the opioid epidemic in suburban and rural areas of the US (Cerdá et al., 2017), but marked increases have also occurred in large urban centers.

Both HIV and HCV are transmitted through multi-person use ("sharing") of needles and syringes for injecting illicit drugs. Syringe service programs (SSPs, primarily syringe exchange and legal over the counter sales of sterile needles and syringes), medication assisted treatment for opioid use disorders (MAT, primarily methadone and buprenorphine maintenance treatment) and anti-retroviral treatment (ART) for HIV infection have dramatically reduced HIV transmission in many areas (Des Jarlais et al., 2016), but these programs have been much less effective in reducing HCV infection (Platt, 2017).

New York City has implemented public-health scale "combined prevention and care for HIV" among PWID and HIV incidence has been reduced to 0.01/100 PY. (Des Jarlais, et al., 2016) Large-scale implementation of syringe programs in New York was followed by a substantial reduction in HCV prevalence—from a near saturation level of 90% to a high but clearly less than saturation level of 70%, with an estimated HCV incidence of 18/100 personyears among persons who had begun injecting within the previous 5 years (Des Jarlais et al., 2010; Des Jarlais et al., 2005). Additionally, New York implemented a "Stop Hep C" program in 2004. This program included public education efforts to increase awareness of HCV, increased provision of HCV testing at programs that serve PWID, and increased referrals of HCV seropositive individuals for further evaluation and HCV treatment with the new "direct acting antivirals." The increase in persons who have received treatment for HCV infection, however, has not been sufficient to generate a "treatment as prevention" effect for

HCV. Recently, in conjunction with the NY State program to “End the HIV Epidemic,” the governor and Commissioner of Health have announced a program to “End the HCV Epidemic,” with increased funding for access to Hepatitis C medications and expanded prevention, screenings and treatment services for high risk communities (New York Governor’s Office, 2018).

Concurrent with these positive public health initiatives, New York City has been experiencing an “opioid epidemic,” with overprescribing and diversion of opioid analgesics, transitions from use of opioid analgesics to use of heroin, increased fatal opioid overdoses and transitions from non-injecting to injecting drug use (New York State Department of Health, 2018). Together these factors create conditions conducive to increased transmission of HCV.

In this report, we examine HCV seroprevalence and estimated HCV incidence among persons who began injecting drugs during the course of the “opioid epidemic” (2000–2017) in New York City. We are particularly interested in whether there have been any reductions in HCV infection, suggesting possible cumulative effects of the new interventions or increases in HCV infection, suggesting possible acceleration of the HCV/opioid injecting epidemic. We are also interested in identifying any factors that may be protective against acquiring HCV. Finally, we also consider the implications of the New York City data for addressing HCV in the opioid epidemic in other areas of the US.

2. Materials and Methods

The data presented here were collected between January 2007 and December 2017 as part of a long-running study of persons entering Mount Sinai Beth Israel drug detoxification and methadone maintenance programs in New York City. The methods for this “Risk Factors” study have been previously described (Des Jarlais et al., 2009; Des Jarlais et al., 1989) so only a summary will be presented here. The programs serve New York City as a whole and there were no changes in the requirements for entrance into the program over the study period.

In the detoxification program, research staff visited the general admission wards of the program in a preset order and examined all intake records of a specific ward to construct lists of patients admitted within the prior three days. All of the patients on the list for the specific ward were asked to participate in the study. As there was no relationship between the assignment of patients to wards and the order that the staff rotated through the wards, these procedures should produce an unbiased sample of persons entering the detoxification program. In the methadone program, newly admitted patients (those admitted in the previous month) were asked to participate in the research.

Participants were paid $20 for their time and effort. In both programs, approximately 95% of those asked agreed to participate. Common reasons for non-participation included medical appointments or other scheduled activities that would not permit study completion in a single visit.

Written informed consent was obtained and a trained interviewer administered a computer-assisted structured interview covering demographics, drug use, risk behavior, and use of HIV and HCV services (NSPs, MAT, HIV and HCV testing and treatment). Participants were asked if they had ever injected illicit drugs, and if they replied that they had, they were asked about non-injecting drug use prior to first injection, when they first injected, and when they had last injected. For the purposes of this report we operationally defined persons currently injecting drugs (cPWID) as (1) persons who reported non-injecting drug use prior to or during the same year as their first injection, (2) their first injection as occurring in 2000 or later, and (3) were injecting during the six-month period prior to their interview. The cPWID may or may not have used non-injected heroin/cocaine during periods when they were injecting. Persons who formerly injected drugs (fPWID) but "reverse transitioned" back to *exclusively non-injecting drug use* were operationally defined as persons who (1) reported non-injected use of heroin/cocaine prior to their first injection, (2) had a first injection in 2000 or later, (3) had not injected for at least six months prior to the interview, but (4) had used heroin and/or cocaine through non-injecting routes at a level where they voluntarily sought treatment.

The year 2000 was selected as an approximate start for the new "opioid epidemic" as it was just before the very large increase in overdose deaths in the US (National Center for Health Statistics, 2017; United States Department of Health and Human Services (US DHHS, 2017). Thus, all of the persons in the analyses would have begun injecting during the current opioid epidemic; the cPWID were injecting at the time of interview and the fPWID would have both begun and ceased injecting during the opioid epidemic.

After the interview, participants were seen by counselors for HIV and HCV pre-test counseling and serum collection. HIV testing was conducted at the New York City Department of Health laboratory using a commercial, enzyme-linked, immunosorbent assays (EIA) test with Western blot confirmation (BioRad Genetic Systems HIV-1–2+0 EIA and HIV-1 Western Blot, BioRad Laboratories, Hercules, CA). HCV testing was also conducted at the New York City Department of Health laboratory using the Abbott HCV enzyme immunoassay (EIA) 2.0 test. [Note HIV prevalence and incidence among PWID entering the Mount Sinai Beth Israel treatment programs have previously been reported (Des Jarlais et al., 2011; Des Jarlais, et al., 2016) and will not be reported here.]

Subjects were permitted to participate on multiple occasions, though only once per calendar year. For these analyses, however, we utilized only the last interview for persons who participated multiple times in the study from 2007 to 2017.

We first compared HCV prevalence among fPWID and cPWID, and then used multivariable logistic regression with backwards elimination to identify statistically significant variables that distinguished HCV seropositive cPWID from HCV seronegative cPWID. All variables that were significant at $p < 0.05$ in univariate analyses were entered into the multivariable analysis.

We used two methods to estimate HCV incidence among the cPWID. First, we assumed that (1) all cPWID were HCV seronegative when they began injecting, (2) those who

seroconverted did so at the midpoint between their time of first injection and the time of their most recent interview, and (3) there was no differential loss to the PWID population between HCV seropositives and HCV seronegatives. We then calculated the HCV incidence rate as the number of HCV seropositives divided by the sum of the years since first injection among those who remained seronegative and half of the years since first injection among the seropositives. For the second method, we used the slope of the logistic regression of HCV prevalence by years since first injection.

Finally, we examined risk behavior among HCV seropositives and HCV seronegatives to assess the likelihood of future HCV transmission.

Stata software (STATA Corp, 2012) was used for statistical analyses. The study was approved by the Mount Sinai Beth Israel Institutional Review Board.

3. Results

Between January 2007 and December 2017, we recruited a total of 846 study participants among entrants to the Mount Sinai Beth Israel drug use treatment programs who reported beginning to inject in 2000 or later. These represented 32% of the 2687 participants who participated in our study during the data collection period and reported a history of injecting drug use. The percentage of study participants who first injected in 2000 or later among all study participants with a history of injecting increased over time—reaching 46% in 2017. While there are still sizable numbers of persons who began injecting before 2000 among entrants to the Mount Sinai Beth Israel substance use treatment programs, it is likely that persons who began injecting during the current opioid epidemic will soon become the majority of PWID entering the programs. The 846 participants in the analyses present here thus represent the likely future for PWID entering the MSBI and other drug treatment programs in New York City.

3.1 Demographics, Drug Use, and HCV Serostatus Among fPWID and cPWID

Of the 846 who first injected in 2000 or later, 97 (11%) had “reverse transitioned” (from injecting back to exclusively non-injecting drug use) by 2017. Table 1 presents comparisons of demographic characteristics, age at first injection, injecting and non-injecting drug use, previous methadone maintenance treatment, and HCV prevalence for the cPWID and fPWID. The fPWID had a substantially lower HCV prevalence (30% versus 49% among the cPWID; chi square = 10.14, p = 0.002) Additionally, the fPWID were older, had begun injecting at a later age, were less likely to be White and more likely to be African-American or Latinx. As expected, the fPWID were more likely to be currently (in six months prior to interview) using intranasal heroin, intranasal cocaine, and smoking crack cocaine compared to the cPWID, though very substantial proportions of the cPWID (from 12% to 53%) also reported current non-injecting use of heroin, speedball (combined heroin and cocaine), cocaine and diverted (“street”) methadone. For the cPWID, injecting heroin and/or cocaine did not preclude concomitant non-injecting use of these drugs.

3.2 Factors Associated with HCV Seropositive Status Among cPWID

Table 2 presents factors associated with being HCV seropositive among cPWID at the time of the interview. Among the demographic and drug history factors, age, years since first injection and Latinx ethnicity, and ever having entered methadone maintenance treatment were all statistically significant in both the univariate and multivariable analyses.

Among recent drug use behaviors, injecting cocaine was significant in both univariate and multivariable analyses. There was a substantial difference in the HCV prevalence between cPWID who reported non-injecting use of heroin (43%) versus cPWID who did not report noninjecting use of heroin (53%) (chi square (1) = 7.9, p = 0.005). Many of the cPWID who reported non-injecting use of heroin reported frequent use—34% reported daily or more frequent noninjecting drug use and non-injecting heroin use was strongly associated with less frequent injecting (OR = −0.87 per step in an 8-step frequency of use scale from no use to multiple times per day, 95% CI 0.82 – 0.94).

3.3 Estimated HCV Incidence Among cPWID

As noted in methods, we used two ways of estimating HCV incidence. Calculating HCV incidence for the cPWID who started injecting in 2000 or thereafter (assuming they were HCV negative when they started and, if infected, contracted the virus halfway in their injection career) yields a point estimate of 13/100 PY (95%CI: 12/100 PY – 14/100 PY), based on a count of 352 HCV seropositives and 2,748 years since first injection. Using the slope of the logistic regression of prevalence by years since first injection yields a point estimate of 14/100 PY (95% CI: 10/100 PY - 18/100 PY).

Examination of HCV prevalence by years injecting also suggested very high HCV incidence in the first years after first injection. HCV prevalence was quite high at 30% among persons with two or fewer years since their first injection, rose to 50% among persons with 3–5 years since first injection, and then started to level off at 60% among persons with 6+ years since first injection.

We assessed estimated HCV incidence for the first half of the study period (2000–2008) versus the second half (2009–2017) using the first method described above (which utilizes data for individual subjects and produces a narrower 95% CI). HCV incidence across periods was essentially unchanged and was estimated at 19/100 PY in the first half of the study and at 20/100 PY in the second half of the study.

3.4 HCV Transmission Risk Potential and HCV Acquisition Risk Potential

The HCV prevalence and estimated HCV incidence among the cPWID are substantial. In order to assess the likelihood of continuing HCV transmission among this group we examined HCV acquisition risk behavior among the HCV seronegatives and HCV transmission risk behavior among the HCV seropositives.

Among the HCV seronegative cPWID, 18% (72/397) reported receptive sharing (injecting with needles/syringes used by someone else) in the six months prior to the interview. These seronegatives represented 10% of the cPWID population in this study. Among the HCV seropositives, 21% (73/352) reported distributive sharing (passing on their used needles/

syringes to others) in the six months prior to interview. These seropositives also represented 10% of the cPWID population in the study. Distributive sharing was particularly common among the HCV seropositives who were injecting cocaine in the six months prior to the interview: 28% of the HCV seropositives injecting cocaine reported distributive sharing versus 14% of the HCV seropositives not injecting cocaine (chi square (1) = 11.3, p =0.001).

4. Discussion

As noted in the introduction, the Governor of New York State has recently called for an "End to HCV" in the state. Given the success of combined prevention and care controlling HIV in the state, extending public health efforts to address HCV is a laudable goal. However, this effort is being undertaken during the current opioid epidemic, which includes many persons who transition from non-injecting to injecting drug use, and who are at very high risk for acquiring HCV. The estimated incidence of 13/100 PY for persons who began injecting in 2000 – 2017 is clearly unacceptably high for efforts to "end the HCV epidemic" among PWID in New York City. The separate incidence estimates for persons who began injecting in the first and second half of the study period were almost identical, suggesting no cumulative effect of the interventions on HCV incidence among persons beginning to inject. From the very high HCV prevalence, 30%, among persons with 0–2 years since their first injection, we suspect that the HCV public health programs are not reaching PWID in the critical few years after they begin injecting. Ending the HCV epidemic may take new interventions that would (1) prevent initiation into injecting drug use, (2) reach very new injectors, and perhaps facilitate return to non-injecting drug use, and (3) scaling up treatment for HCV to substantially reduce background seroprevalence and create a "treatment as prevention effect."

We did find that ever having entered methadone maintenance treatment was associated with being HCV seropositive. This should not be interpreted as methadone treatment being a cause of HCV exposure. Rather persons who voluntarily enter methadone treatment tend to have more chronic/intractable drug problems and thus would be more likely to have been exposed to HCV.

The higher HCV prevalence among our Latinx participants may reflect travel between New York City and Puerto Rico (Deren et al., 2007). Controlling HCV transmission among PWID in New York City may also require controlling HCV transmission in Puerto Rico.

Our data also suggest potentially important roles for additional harm reduction strategies. First, a modest percentage (11%) of persons who began injecting in 2000 or later had "reversed transitioned" back to injecting drug use by 2017. They averaged two years less since first injection than persons who had continued injecting, and had a substantially lower HCV prevalence (30% compared to 47%). There are reports of reverse transitions back to noninjecting drug use from other areas, including Baltimore (Genberg et al., 2011) and Iran (RahimiMovaghar et al., 2017). As in New York City, the reverse transitions occurred without the benefit of any formal interventions to encourage the transitions. Developing and implementing formal interventions to facilitate reverse transitions among persons highly likely to continue heroin and cocaine use could be a useful complement to existing programs

to reduce HCV transmission. There have been occasional efforts to support reverse transitions (Hunt, 1999; Pizzey and Hunt, 2008), but this must be considered an extremely underdeveloped area of substance use intervention research.

Second, a full transition back to non-injecting drug use may not be necessary to produce some protection against exposure to HCV. In this study, 58% of the cPWID reported noninjection heroin use in the six months prior to interview, and this group has a significantly lower likelihood of being HCV seropositive compared to cPWID who did not use non-injecting heroin (AOR = 0.72, 95% CI 0.52–0.99). Interventions to assist persons who do not fully cease injecting to at least partially substitute non-injecting drug use for injecting drug use might also reduce HCV transmission. Non-injecting drug use also reduces the likelihood of various infections and overdose, so that interventions to encourage substituting non-injecting for injecting drug use could provide multiple individual and societal benefits.

Third, while most HCV prevention programs emphasize reducing acquisition risk behavior among HCV seronegatives, our data also indicate the importance of reducing HCV transmission behavior among HCV seropositive PWID. In this study, 21% of the 352 HCV seropositive cPWID reported distributive sharing of used needles and syringes. This high rate of transmission risk behavior is then amplified by the high HCV seroprevalence (47%) among cPWID in this study. HCV infected persons who inject cocaine may be good candidates for HCV treatment as prevention, as successfully treating HCV among this group may greatly reduce further HCV transmission. It would be important, however, to also develop interventions to reduce the chances of HCV re-infection among this group. Treatment of all HCV infected persons in a PWID social network would be one possibility.

4.1 Future Research And Intervention Development, New York and Elsewhere

In this study, we have noted that becoming a “former injector” was associated with significantly lower HCV prevalence compared to remaining a “continuing injector.” Former injectors have been observed in other locations, including Baltimore (Genberg et al., 2011) and Iran (Rahimi-Movaghar et al., 2017) and we suspect that they are occurring in many other locations. However, reverse transition to exclusive non-injecting drug use is certainly not a wellstudied phenomenon. Given the multiple very serious individual and community harms associated with injecting drug use, we would suggest much greater research on reverse transitions. How do reverse transitions naturally occur in the community?How might interventions facilitate among persons who are going to continue to use injectable drugs? What interventions might reduce the chances of relapsing to injecting among persons who have reversed transition back to exclusive non-injecting drug use?

We also found that non-injecting heroin use was associated with lower HCV prevalence among cPWID. How might new interventions facilitate substitution of non-injecting use for injecting among persons who continue to inject drugs?

Harm reduction for PWID has been largely defined in terms of “safer injection,” using sterile injection equipment, proper preparation of the injecting site, etc. We would like to suggest that harm reduction for PWID be broadened to include reverse transitions back to

exclusive noninjecting use and frequent substitution of non-injecting for injecting use. Exploration of these ideas may be particularly important in areas of high HCV transmission and high rates of fatal overdose.

5. Limitations

Several limitations of this study should be noted. First, the participants were recruited from entrants into a single set system of substance use programs and are not a random sample of people who use drugs in New York City. HIV and HCV infection among participants in the Risk Factors study has tracked consistently with HIV infection data from other sources in New York City (Des Jarlais, et al., 2016; Des Jarlais, et al., 2000; Des Jarlais, et al., 2000; Des Jarlais et al., 1998; Murrill et al., 2001; Thomas, 2001). We did compare our results with those of a recent community-based New York City study of “young injectors” recruited through peer referral and staff outreach over the same time period as our study (Eckhardt et al., 2017). HCV prevalence among the cPWID in this study (47%) was almost identical to the HCV prevalence (48%) in the Eckhardt et al. study. In both studies the mean years since first injection was 5, and years since first injection and cocaine injecting were significantly associated with being HCV seropositive. The similarities in the data from these two studies would indicate that there is minimal bias due to recruitment site across the studies.

Second, the data are from persons who were entering treatment. Some persons who began injecting in 2000 or later may have ceased injecting without entering treatment, or may have injected at sufficiently low levels that they did not need treatment, or may have entered treatment and successfully reduced their drug injecting to where they would not be considered “continuing” to inject drugs. Each of these groups would presumably have lower HCV prevalence than persons in our sample. Again, however, the results presented here are similar to those in the recent study by Eckhardt and colleagues (2017).

Third, we did not have data on risk behavior at the time of HCV exposure among our participants. The associations between injecting risk behaviors in the last six months and current HCV serostatus would reflect actual transmission factors only if the behaviors had remained relatively consistent from the time of exposure up to the time of interview. We do believe, however, that it is certainly plausible that persons injecting cocaine at the time of interview were likely to have been injecting cocaine prior to HCV exposure, and cocaine injecting has been strongly associated with exposure to blood-borne viruses (Thorpe et al., 2002). Similarly, it is plausible that persons currently using non-injected heroin had done so throughout much of their injecting careers, and that such non-injecting drug use had partially protected them against exposure to HCV. We would also note that the distributive sharing reported by the HCV seropositives was for the time period when they were seropositive, so the potential for them to transmit HCV does not require any assumptions of consistent behavior over time.

These limitations are important, but would not appear to have artificially generated the important patterns—reverse transitions to non-injecting drug use, estimated HCV incidence, risk factors for current HCV serostatus—in our data. Rather, we believe it is likely that the patterns we observed occurred despite these limitations.

6. Conclusions

Like many other areas in the US, New York City has experienced large numbers of persons beginning to inject drugs and becoming infected with HCV. Multiple interventions will be needed to control HCV infection among persons who have begun injecting during the current opioid epidemic. The New York City data suggest possible additional harm reduction strategies for reducing HCV transmission among PWID. These could include supporting "reverse transitions" from injecting back to exclusively non-injecting drug use, substituting non-injecting use for injecting use among PWID who continue to inject heroin, and interventions to reduce distributive sharing and to treat HCV infection among HCV infected PWID.

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Highlights

- Reverse transitioning was strongly associated with lower HCV seroprevalence.
- HCV seropositivity was inversely associated with current non-injecting heroin use.
- Injecting cocaine was associated with behavior likely to transmit HCV.
- NYC has high rates of HCV infection among persons who began injecting since 2000.

Table 1.

Demographic and drug use characteristics among PWID starting to inject in 2000 or later entering drug treatment in NYC (2007–2018)

	cPWID	fPWID	Total
	N(%)	N(%)	N(%)
Total	749 (100.0)	97 (100.0)	846(100.0)
Avg. age (SD) *	35 (9)	41 (8)	35 (9)
Avg. years injecting (SD) *	5 (1)	2 (4)	5 (4)
Gender			
Male	591 (78.9)	77 (79.4)	668 (79.0)
Female	155 (20.7)	20 (20.6)	175 (20.7)
Race/ethnicity *			
White	326 (43.5)	20 (20.6)	346 (40.9)
African-American	95 (12.7)	28 (28.9)	123 (14.5)
Latinx	296 (39.5)	44 (45.4)	340 (40.2)
Other	32 (4.3)	5 (5.2)	37 (4.4)
Injected drugs			
Speedball	291 (38.9)	NA	NA
Heroin	726 (96.9)	NA	NA
Cocaine	304 (40.6)	NA	NA
Amphetamine	16 (2.1)	NA	NA
Non-injected drugs			
Intranasal speedball	89 (11.9)	8 (11.8)	97 (11.9)
Intranasal heroin *	403 (53.8)	50 (73.5)	453 (55.4)
Smoked heroin	24 (3.2)	2 (2.9)	26 (3.2)
Intranasal cocaine *	197 (26.3)	27 (39.7)	224 (27.5)
HCV+ *	352 (47.0)	29 (29.9)	381 (45.0)

* $p<0.05$

Table 2.

Odd ratios and 95% confidence intervals of associations with HCV seropositive status among cPWID in univariate and multivariable logistic models

	HCV Prevalence (%)	Univariate			Multivariable		
Variable		OR	LCL	UCL	OR	LCL	UCL
Recruitment							
Detox (ref.)	44	1.0			1.0		
MMP	60	1.88	1.26	2.79	1.74	1.13	2.69
Age		1.05	1.04	1.07	1.05	1.03	1.08
Years injecting		1.15	1.11	1.20	1.12	1.08	1.17
Race/Ethnicity							
White (ref.)	41	1.0			1.0		
African-American	45	1.22	0.77	1.93	1.02	0.59	1.74
Latinx	56	1.88	1.37	2.58	1.62	1.13	2.30
Other	34	0.77	0.36	1.65	1.14	0.50	2.60
Injecting speedball							
Yes	54	1.58	1.18	2.12	N.S.		
No	43						
Injecting cocaine							
Yes	54	1.63	1.22	2.19	1.84	1.32	2.55
No	42						
Injecting amphetamine							
Yes	19	0.25	0.07	0.90	N.S.		
No	48						
Non-injected methadone							
Yes	46	0.94	0.69	1.29	-		
No	47						
Intranasal cocaine							
Yes	41	0.70	0.50	0.97	N.S.		
No	49						
Smoked cocaine							
Yes	47	0. 0.97	0.73	1.30	-		
No	47						
Any non-injecting heroin							
Yes	43	0.66	0.49	0.88	0.72	0.52	0.99

	HCV Prevalence (%)	Univariate			Multivariable		
No	59						
Any previous detox or MMT							
Yes	673	1.68	1.01	2.80	N.S.		
No	70						